

Manual personal hygiene device with a treatment instrument which can be driven by ultrasonic vibrations

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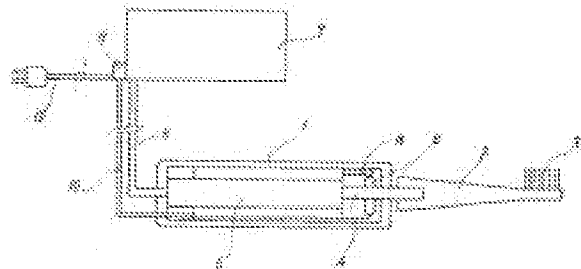
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Abstract of **CH 609238 (A5)**

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The manual device has an ultrasonic motor (5) which causes the treatment instrument, preferably a plug-on toothbrush (2, 3) to execute ultrasonic vibrations, and an electrical switch (8, 9) which is actuated when a predetermined contact pressure exerted on the instrument is exceeded and switches on a buzzer (11) or an optical signal emitter. In fact, since ultrasonic vibrations are greatly attenuated by the bristles of toothbrushes



and thus are virtually ineffective if the bristles are loaded with a force higher than about 1N the user notices in this way that he/she exerts excessive pressure on the device. The manual device can also be fitted with an additional vibrator which drives the treatment instrument at the mains frequency or at twice the mains frequency and is designed in such a way that its vibrations are blocked when the critical contact pressure is exceeded.

CLAIMS

1. Handset the personal care with an instrument with an ultrasound of motor its vibrations on the instrument transmitted, arranged drivable by ultrasonic vibrations, in the handle of the apparatus, become, and with an ultrasonic frequency generator exciting the ultrasonic motor. characterised in that a device (8-11; 18-21; 18a-21a) provided is, which by the pressing force applied on the instrument head is influenceable and changes with exceeding of a predetermined pressing force its operating condition in a manner perceptible for the user.
2. Handset according to claim 1. characterised in that in the handle (1) except the ultrasonic motor (15) the instrument (2, 3) with low sonic frequencies or ultralow frequencies, in particular with the simple or double frequency, propelling vibrator (18, 20, 21; 18a, 20a, 21a) arranged is.
3. Handset according to claim 2, characterised in that in the handle (1) the ultrasonic motor (15) exhibiting carrier (14) for the instrument (2, 3) swingable journaled and by the mentioned vibrator (18, 20, 21; 18a, 20a, 21a) is more drivable.
4. Handset according to claim 3, characterised in that of the carriers (14) and thus the instrument (2, 3) around one to the pressure-flat of the instrument head (3), in particular the bristles of a toothbrush, vertical oriented axis (13) pivotally mounted is.
5. Handset according to claim 4, characterised in that the mentioned vibrator from an electromagnet connectable to a.c. mains (20,21; 20a, 21a) with at the rear end of the carrier (14) for the instrument attached anchor-hurry (18; 18a) and the carrier (14) of the action exists at least a return spring (19) is subject.

6. Handset after one of the claims 1-5, characterised in that the device from an acoustic or optical signal transmitter (11), influenceable by the pressing force of the instrument head, exists, which over one in the handle (1) mounted switch (8, 9) is capable of being activated. and this switch by expenditure guidance width units resilient with exceeding of the predetermined pressing force of the instrument head (3) or pivoted part (4) is more operable.

7. Handset according to claim 6, characterised in that mentioned part of the carriers (4) for the instrument (2, 3) is.

8. Handset according to claim 6, characterised in that mentioned part the stem (2) of the instrument is.

9. Handset according to claim 6, characterised in that of the signal transmitters in the handle arranged is.

10. Handset according to claim 6, characterised in that of the signal transmitters (11) in of the handle (1) a separated and with this over lines connected, the ultrasonic frequency generator contained circuit housings (7) arranged is.

11. Handset according to claim 6. characterised in that of the signal transmitters (11) a buzzer is.

12. Handset after one of the claims 1-5, characterised in that the device by the mentioned vibrator (18-21, influenceable by the pressing force of the instrument head (3); 18a-71a) formed and this vibrator to this purposes in such a manner established is. that with exceeding of the predetermined pressing force of the instrument head the vibrations of the instrument suppressed generated by this vibrator become.

13. Handset according to claim 1. characterised in that the ultrasonic vibrations of the instrument head with the simple or double frequency modulated are.

14. Handset according to claim 1. thus characterized.

that a liquid supply also at the instrument head. in particular in the bristle bed of a toothbrush. flowing outlets provided is.

15. Handset according to claim 1. thus characterized.

that the predetermined pressing force. with which which it changes for v hnte device their operating condition. 0.8-1 N amounts to.

16. Handset according to claim 1, characterised in that the envähnte device by a pressure-sensitive sensor is releasable.

The invention refers to an handset to the personal care with by ultrasonic vibrations a drivable, preferably replaceable instrument, in particular a toothbrush, with one in the handle of the Ge of advice arranged ultrasonic motor, its vibrations on the instrument. in particular the bristles of a toothbrush, are more transferable. and with an ultrasonic frequency generator, preferably to the net connectable frequency converter, exciting the ultrasonic motor.

Such handsets are already known; in particular lively toothbrushes become for example in the USA patent specifications 3,828,770 and 3,840,932 described with ultrasonic vibrations. The ultrasonic motor exhibits thereby for example a piezoelectric element, with which it can act around a ceramic material out of lead zirconate titanate in form of a tube. This member is in the elongated handle of the apparatus arranged and becomes over a suitable ultrasonic frequency generator fed of a.c. mains, which is in a separated circuit housing accommodated and over an electric lead with the handle connected. to ultrasonic vibrations excited. These ultrasonic vibrations become over parts of the handle and/or. to the receptacle of the replaceable toothbrush certain a carrier as well as over the bristle handle on the bristles transmitted, which in this way to vibrations, generally to prolonged oscillations toward the handle axle. excited become.

Physical ones one counts generally frequencies above 20,000 hzs to the ultrasonic range. in connection with the handset interesting here however the general frequency range of approximate 10,000 hzs upward understood is to become with the term ultrasonic frequencies.

Prefered ones become however ultrasonic frequencies within the range of approximately 20,000 hzs to approximately 35,000 hzs selected.

Practical trials have shown that with ultrasonic vibrations lively toothbrushes. if they of the user proper handled become. indeed unfold a particularly good cleaning effect and in particular a large removal of the so called plaque make possible; bottom plaque understands one the substances slimily adhesive at the teeth, which major consists of bacteria or bacteria products, tooth and gum illnesses. in particular the Zahnkaries and the Parodontose, cause or at least favour and in lapses of time by mineralizing in tartar the converted become.

Opposite conventional electric propelled toothbrushes, which z. B. Vibrations with the frequency between 25 and 11) 0 hzs and with amplitudes from several millimeters to order-of-magnitude-wise 1 cm implement, have however with ultrasonic vibrations working toothbrushes the serious drawback, that the vibration amplitudes unite only with approximately 1 CO2 mm lie and therefore found of the user so easily observed or cannot become.

whether the brush swings or not. In addition shown has itself.

that the mentioned above good cleaning effect and

seitigung the plaque only then achieved become. if the user presses the bristles of the brush with one much small force against the teeth. because otherwise the ultrasonic vibrations of the bristles become suppressed and thus a Reini is void gungswirkung. Actual ones become the ultrasonic vibrations of the bristles with rising outside load rapid damped, and the bristle movement becomes practical already blocked. if the applied contact pressure one relatively low value achieved. This critical pressing force lies far below that value, which users of conventional electric toothbrushes according to experience use with the tooth flash and which usually between 2 and 3 N, ordinary approximate 2.5 N, amounts to.

Since now the user of an ultrasonic toothbrush does not notice the bristle movements practical, it has the tendency. to exercise a much to strong contact pressure, with the success that the bristle movement becomes blocked or at least strong braked and therefore the cleaning effect practical is void. Even if one refers to in an operating instruction this substantial circumstance with the use of an ultrasonic toothbrush, it is hardly to be expected that this condition, which must become the achievement of a reasonable cleaning effect and natural also an optimal Mikromassage action absolute fulfilled. always noted becomes. It is according to experience extraordinary difficult to divert someone of a habit of many years. D. h.

to arrange in present cases, the toothbrush no more with since childhood the used to use relatively strong pressing force. From this reasons is the practical success of the known ultrasonic toothbrushes and also different handsets to the personal care. with an instrument, for example to the Massage, drivable by ultrasonic vibrations, very limited works, because he depends exclusive on the continuous attention of the users and also such attentive users.

those consciously only a very light contact pressure exercise, are safer usually never whether this contact pressure is not nevertheless so large that a cleaning and a Massagewirkung become prevented.

The invention is the basis the object to eliminate this serious drawback and an handset of the initially described type. in particular an ultrasonic toothbrush to create it the user in a simple manner possible to determine whether the desired ultrasonic action becomes achieved with the use or not.

To the solution of this object the handset is after the invention characterised in that a device provided is. which is influenceable by the pressing force applied on the instrument head and changes with exceeding of a predetermined pressing force their operating condition in a manner perceptible for the user.

With the handset after the invention thus the user becomes each time attentively made on it if it exercises a too strong pressing force. so that it can correct the contact pressure corresponding in each case. That guarantees that the advantages of the handset become effective to the invention also actual and in particular an ultrasonic toothbrush its optimal cleaning and Massagewirkungen deployed.

It can preferably consist the device influenceable by the pressing force of the instrument head of an electromechanical vibrator arranged in the handle of the apparatus which that brings pivotal stored instrument with a low sonic frequency to rockers and in such a manner established is that this naturally easily vibration perceptible of the user becomes suppressed, if it exercises one for the ultrasonic action to strong contact pressure. Such a vibrator will appropriately improve and supplements direct with frequency or however with the double frequency operated, and the additional vibrations of the instrument generated to the ultrasonic vibrations still the treatment effect.

On the other hand the influenceable can consist the device by the pressing force also of an acoustic or an optical signal transmitter, which is capable of being activated over in the handle ange brought a switch, which by the expenditure-steered or pivoted resilient with exceeding of the predetermined pressing force carrier for the instrument or however by the instrument handle operated becomes. With this signal transmitter it can concern in particular a buzzer, which is

either direct in the handle of the apparatus or but into detn the ultrasonic frequency generator contained circuit housings accommodated.

Ordinary one lies the critical pressing force, which may not be exceeded with use of an ultrasonic toothbrush. with approximately 0.8 to at the most 1 N, so that the device influenceable by the pressing force becomes preferably so designed that it addresses pressing force with approximate 0.9 N and/or. their operating condition changes.

Since the cleaning effect of an ultrasonic toothbrush becomes according to experience amplified with presence of liquid due to the cavitation arising then, it can be favourable to also plan in actual known manner with the handset after the invention a liquid supply at the bristle bed flowing outlets. Likewise it can be favourable to the increase the cleaning and Massageeffekte. to modulate the ultrasonic vibrations of a toothbrush in actual known manner with the simple or the double frequency.

The invention becomes more near explained on the basis the designs at schematic represented embodiments, which are in the section shown. Show:

Fig. 1 a first embodiment of an ultrasonic toothbrush with an acoustic signal transmitter. with tlberschrei ten a predetermined pressing force of the bristles over a switch arranged in the handle is more operable,

Fig. 2 a second embodiment of an ultrasonic toothbrush with an additional electromechanical vibrator, which propels the toothbrush with the double frequency and whose vibrations suppressed become, if the user a predetermined pressing force of the brush over cry tet, and

Fig. 3 a variant of the embodiment after Fig. 2 with an electromechanical vibrator, which becomes operated with the simple frequency.

After Fig. 1 exhibits the ultrasonic toothbrush an housing in form of an elongated handle 1, on a which replaceable toothbrush 2 with the bristles 3 mounted is. The toothbrush 2 sits on a carrier of 4, is 5 attached at which an ultrasonic motor, its vibrators for example from a suitable piezoelectric element exists.

The ultrasonic motor 5 becomes energized over the leads 6 by an ultrasonic generator, which is in a separated circuit housing 7 accommodated and can by means of the lead 12 to the net connected become.

Since it usually concerns a a.c. mains, the ultrasonic generator consists appropriately of a corresponding frequency converter, which the ultrasonic motor 5 preferably with frequencies between 20,000 and 35,000 Hz energized.

The vibrations of the ultrasonic motor 5 become over the carrier 4 and the stem of the toothbrush of 2 3, which corresponding ultrasonic vibrations implement toward the handle axle with an amplitude, which some hundredths of millimeters transmitted on the bristles amount to order-of-magnitude-wise.

This bristle movement becomes however to a large extent braked, if the contact pressure of the bristles 3 against the teeth, applied of the user, and/or. the gums 0,8 to 1 N exceed. Trials have shown that optimal Reinigungs- und Massagewirkung becomes achieved only if the pressing force applied of the user remains below the critical value. Since however the user notices and therefore not determine cannot the ultrasonic vibrations of the bristles practical whether with a certain pressing force the bristles actual move or are not, in the handle 1 an electrical switch provided, which consists of a fixed contact 8 and with this cooperative contact 9 attached at the carrier 4. These two switch contacts 8 and 9 lie over a lead 10 in the electric circuit of a buzzer 11, which is in the circuit housing 7 accommodated and likewise becomes over the mains connection line 12 fed. The carrier 4 is in such a manner movable formed and arranged that after Fig. 1 normally closed switches 8, 9 by removal of the contact 9 of the contact 8 opened becomes, if the pressing force applied of the user on the bristles 3 exceeds the critical value, for example 0.9 N. The buzzer 11 is switched on by opening the switch and the user is warned, which thereupon so far can reduce its contact pressure, until the switch becomes again closed and thus the buzzer disabled.

The required moving bariness of the carrier 4 can be reached by the fact that it becomes either corresponding resilient formed or but pivotally mounted around a small angle; in addition in last cases is the carrier 4 linking up, suitable sized spring provided, which ensures that the switch is normally 8, 9 closed, as long as the critical pressing force is not exceeded.

If necessary the switch can become also by the stem of the toothbrush operated, if this stem partly projects in the interior of the handle 1. In addition the natural arrangement can be also so met that the switch is normally open and only with exceeding of the critical pressing force closed becomes and switches then the buzzer on.

In place of a buzzer also any other acoustic or also optical signal transmitter can become used, whereby however generally an acoustic signal transmitter will be more convenient. If necessary the signal transmitter can be also in the handle 1 accommodated.

In the embodiment after Fig. 2 of an ultrasonic toothbrush is in the handle 1 a carrier 14 journaled pivotal around an axis 13, on whose front end a replaceable toothbrush 2 with the bristles 3 mounted and at its region of the vibrators of an ultrasonic motor located behind it 15 attached are. This vibrator is in the considered example a staff from magnetostrictive material, for example from Monel, can z. B. and are from a spool attached at the handle 1 16 surrounded have a square cross section of 7 x 7 mm. The spool 16, those the staff with sufficient clearance e.g. surrounds and. to have over the outward guiding lead 22 by an ultrasound accommodated in a separated circuit housing frequency generator fed knows, becomes a light inside diameter of 12 mm; the ultrasonic vibrations of the magnetostrictive staff become again over the stem of the toothbrush 2 on their bristles 3 transmitted. Those vertical to the support surface of the bristles 3 oriented pivot axis 13 of the carrier 14 forms a nodal point, and the distance between this and the bristles 3 amounts to preferably a quarter of the ultrasonic wave-prolonged or an odd Multiple one of it.

Except the ultrasonic motor the handle 1 contains 15 after Fig. 2 an electromechanical vibrator in form of an electromagnet with a spool 21 and a movable.

at a rear extension 17 of the carrier 14 attached armature 18. 14 springs 19 attached reciprocally attacking at the extension 17 of the carrier at the handle walls work as return springs and define the rest positions of the toothbrush 2, 3. If the solenoid becomes 21 connected over the outside lead 23 to a.c. mains, then the vibrator and thus the toothbrush with the double frequency in the sense of the double arrow swing around the axis 13.

The vibrator and the spring 19 are so sized that the vibrator oscillation becomes blocked. if the pressing force applied on the toothbrush exceeds the mentioned critical value. In this way the noted user immediately. that it must reduce the pressing force, and it can select the now light pressing force continuous in such a way that the vibrator and thus the toothbrush continuous with sufficient amplitude swing. This vibration amplitude of the toothbrush head can between 1 and 10 mm. preferably between 2 and 4 mm lie. In addition this additional vibration of the toothbrush with the double frequency, thus generally with 100 hzs, brings additional Reinigungsund

Massagewirkung with itself, which the ultrasonic action supplemented. General one can work the vibrator, which can have also another structure than described, with possibly a suitable frequency within the low sound range or if necessary also in the Infraschall region, thus bottom 16 hzs; substantial is that the toothbrush oscillation generated of this vibrator becomes in remarkable manner of the user perceived. Regarding the additional cleaning and Massagewirkung and because of the simpleness of the supply however a direct electromechanical vibrator connectable to a.c. mains is very convenient.

The embodiment after Fig. 3. with which with the example after Fig. 2 coincident parts are provided with the same numerals, differ from this example to Fig. 2 only in the structure and in the function of the electromechanical vibrator. On the E-förmigen core of the electromagnet 20a is a winding 21 A arranged divided by a central tapping, while in the feed lines guiding to the coil windings diodes are 24 in such a manner connected that each coil half is flowed through only in each case by current half waves of a polarity and therefore this vibrator with the simple frequency swings, thus generally with 50 hzs. Otherwise this ultrasonic toothbrush works after Fig. 3 in the similar manner as the handset after Fig. 2. Da the toothbrush 2, 3 the bottom action of the vibrator in, thus an oriented plane vertical parallel to the pressure-flat of the bristles to the direction of the pressing force swings, works this pressing force over the entire vibration amplitude essentially uniform as braking force, so that the condition of a practical complete suppression of the vibrator oscillation is fulfillable relatively light with exceeding of a critical pressing force.

The handset after the invention is not limited on the described embodiments. to separate permits both regarding the structure and the function ultrasound of the motor and in particular the device influenceable by the pressing force of the instrument manifold variants. So for example the ultrasonic vibrations with a frequency smaller around orders of magnitude can, in particular with the simple or double frequency. modulated become, which the cleaning and Massagewirkung favourable affected. Just as also a supply of liquid, in particular, by the hollow instrument handle knows waters up to at the instrument head. in particular in the bristle bed of a toothbrush. mounted Austrittsöffnung towards provided its. This liquid becomes then appropriately by one either at the water pipeline or to a special liquid pump connected hose over channel the instrument handle supplied hollow inside the handle.

The other a vibrator can, as it in the examples after Fig. 2 and 3 explained, mainly the improvement the cleaning and Massagewirkung became provided and therefore so designed to be that the vibrations of the instrument bottom outside load become only relatively little damped and therefore with reaching the mentioned critical pressing force only insignificantly braked. In these cases a special is, with the critical pressing force responsive and so the user warning device on the basis Fig. 1 described type provided. That is easily in principle possible, because the vibrations of the instrument vertical generated by a vibrator lie to the direction of the pressing force, while the release the user warning device by an instrument movement toward the pressing force made. One can therefore in the examples after Fig. 2 or 3 a switch S, 9 and a signal transmitter 11 as with the example after Fig. 1 plan, whereby it is to be only ensured that itself the brush handle 2 and/or. the carrier 14 in the region of the switch the bottom action of the pressing force sufficient to move can.

Whole general can be planned also possibly any pressure-sensitive sensor, which responds with reaching the critical pressing force and releases a signal transmitter.

